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# INFLUENCE OF SPACING AND TIME OF PLANTING ON THE YIELD AND SIZE OF THE PORTO RICO SWEETPOTATO<sup>1</sup>

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## PURPOSES OF THESE STUDIES

The influences of time of planting and of the planting distances of sweetpotatoes on the yield and grade of the crop are of great economic importance. The grower wishes to obtain not only a high total yield, but the highest possible yield of U.S. No. 1 or ideal market-size sweetpotato.

Many growers believe that early planting increases the proportion of oversize or "jumbo" roots, and they purposely defer planting in an effort to obtain more of the No. 1 grade. Moreover, late plantings can be made from vine cuttings from early-set plants or from plants of the second or third pulling, thus greatly reducing the amount of seed stock needed. Late plantings may also be made on land used for certain early crops, such as market-garden peas, radishes, or spinach. This practice would result in greater economy of land and would utilize certain fertilizer residues left from the first crop.

With reference to spacing of plants in the row, the grower wishes to obtain the highest yield of marketable sweetpotatoes with the smallest practicable number of plants and the least outlay of labor. Wide spacing is believed by some to cause the development of too many jumbo roots, and yet close spacing requires considerably more plants and labor to set and care for them.

These studies were planned and executed to determine the effects of delayed planting from early summer until midsummer and of spacings of 6, 9, 12, and 15 inches in the row upon total yield and yield of each grade of sweetpotatoes. No one time of planting or

<sup>1</sup> A report on studies carried out cooperatively by the Bureau of Plant Industry, U.S. Department of Agriculture, and the South Carolina Agricultural Experiment Station.

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spacing distance is superior to another unless it gives greater returns to the grower.

It is recognized that the results obtained by planting on the dates given herein are strictly applicable only to regions having soil and climatic conditions similar to those of these experiments. At the same time, however, the conclusions that can be drawn with reference to time of planting are of fundamental importance, since they show clearly the way in which the sweetpotato responds to the season during which it is grown. By comparison of the climatic conditions where these experiments were made with those of other regions, a broad application of the results is possible. Previous work at the Pee Dee Experiment Station, Florence, S.C., has shown that spacing, fertility of the soil, and amount of precipitation during the growing season all affect the proportion of oversize, No. 1 and No. 2 sweetpotatoes. Therefore it is not implied that either the date of planting or the spacing of plants is the most important factor controlling grade and yield of this crop. The important points are that, other things being the same, date of planting does markedly affect yield and grade, even in regions of fairly long growing season; and that grade is affected by planting distance.

### FIELD METHODS

These studies were conducted at the Pee Dee Experiment Station under soil, climatic, and other conditions that are fairly representative of those over a large part of the Middle, South Atlantic, and Gulf States where sweetpotatoes are grown. The Porto Rico variety, the most important in the South, was used. It is possible that other varieties might give different results.

Seed stock of a strain grown at the Pee Dee Experiment Station for several years was used. The land was plowed and prepared in the usual way. Rows were marked out 4 feet apart and a 3-8-9 fertilizer<sup>4</sup> applied in the rows at the rate of 500 pounds per acre. The fertilizer was cultivated in thoroughly, and low ridges were thrown up about 1 week before planting.

Each plot consisted of four adjacent 90-foot rows, and quadruplicate plots were set for each spacing and for each date of planting. Special care was taken to replace all weak or dead plants, and the resultant stand was practically perfect.

Each crop received the usual cultural care throughout the season and was harvested soon after frost killed the leaves. The sweetpotatoes were harvested by first cutting and removing the vines and then plowing the roots out with a sweetpotato harvester. They were freed from the soil by hand and graded into oversized sweetpotatoes or jumbos, U.S. No. 1, and U.S. No. 2, and then weighed.

### SPACING STUDIES

The seed stock for the spacing studies was bedded about April 15, and plants were set in the field about June 1 each year that the work was in progress, namely, 1929, 1930, and 1931. The spacing distances used were 6, 9, 12, and 15 inches in the row. Quadruplicate plots of each planting distance were separated from each other by three plots of similar size, or by a distance of about 52 feet.

<sup>4</sup> 3 percent nitrogen, 8 percent phosphoric acid, and 9 percent potash.

## TIME-OF-PLANTING STUDIES

In order to insure that all plots in these studies were set with plants as nearly alike as possible, seed stock was bedded separately for each planting 1 month before the date that the plants were to be set in the field. Therefore, first-crop sprouts of similar age and origin were available for all planting dates. On account of varying temperatures and moisture conditions in the plant beds there was some difference in the size of the plants from the various beddings. This was particularly true of the later beddings which yielded larger plants on account of higher temperatures. An effort was made, however, to select plants of uniform size for all plantings.

Plantings were made on May 15, May 30, June 15, June 30, and July 15 in 1930, 1931, and 1932. Quadruplicate plots of each planting date were separated from each other by four similar plots, or by a distance of about 65 feet.

## PRESENTATION OF RESULTS

The results of these studies are presented in the tables that follow. In tables 1 and 4 the probable errors of the mean plot yields of jumbos, U.S. No. 1, and U.S. No. 2, and the totals of the three grades were calculated by Bessel's formula. Inspection of these values will indicate that many of them are of such magnitude that no significant differences are evident except in cases of very great differences in yield.<sup>5</sup> If, however, comparisons are made by Student's method, by which plots to be compared are successively "paired" within their respective replicate blocks, a part of the variation due to field irregularity and differences between seasons is eliminated, and a much larger number of comparisons is shown to be significant<sup>6</sup> (tables 2 and 5 to 7). The proportions of the total yields in each grade are shown in tables 3 and 8.

## SPACING STUDIES

In tables 1, 2, and 3 the data obtained from the spacing studies are set forth.

TABLE 1.—*Effect of spacing upon yield of different grades of Porto Rico sweet-potatoes at Florence, S.C., 1929-31*

[Yields expressed as mean yield in pounds of quadruplicate  $\frac{1}{80}$ -acre plots]

Year and spacing	Yield			
	Jumbo	U.S. No. 1	U.S. No. 2	Total
1929	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
6 inches.....	20.5± 3.04	310± 9.40	95± 5.90	425± 7.88
9 inches.....	30.0± 6.07	287±20.08	61± 6.92	378±17.84
12 inches.....	31.7± 3.06	288±12.65	48± 6.34	368±14.18
15 inches.....	49.0± 9.82	348±15.12	58± 6.78	455±14.23
1930				
6 inches.....	12.5± 2.13	235± 7.03	94±13.57	341±21.42
9 inches.....	21.0± 2.37	224± 5.56	92±11.50	337±15.72
12 inches.....	26.0± 4.91	236± 6.48	99±12.75	361±15.63
15 inches.....	34.0± 3.82	216±22.69	83±11.43	335±26.19
1931				
6 inches.....	45.0± 2.99	216±15.19	83± 6.20	344±11.81
9 inches.....	38.0± 7.83	171± 7.80	75± 9.18	284±15.33
12 inches.....	57.0±10.39	175± 7.21	42± 2.76	274±16.13
15 inches.....	53.0±10.11	181± 8.88	53± 1.45	287± 9.50

<sup>5</sup> A difference less than 3.2 times its probable error is considered insignificant. The probable error of a difference =  $\pm \sqrt{(E_1)^2 + (E_2)^2}$ .

<sup>6</sup> Odds of 30:1 or greater are considered significant.



TABLE 2.—Comparison of yields of various grades of Porto Rico sweetpotatoes from plots with the plants spaced 6, 9, 12, and 15 inches apart, Florence, S.C.

[Yields and differences expressed as means of quadruplicate  $\frac{1}{30}$ -acre plots]

Grade	Spacings compared, A and B <sup>1</sup>	1929				1930				1931				Average			
		Yield of different spacings compared		Differences (A - B)	Odds of significance	Yield of different spacings compared		Differences (A - B)	Odds of significance	Yield of different spacings compared		Differences (A - B)	Odds of significance				
		Mean yield, A	Mean yield, B			Mean yield, A	Mean yield, B			Mean yield, A	Mean yield, B						
Jumbo	6 and 9	Pounds 20.5	Pounds 30.0	-9.5	10:1	Pounds 12.5	Pounds 21	-8.5	171:1	Pounds 45	Pounds 38	-7.0	2:1	Pounds 25.00	Pounds 29.76	-3.76	4:1
	6 and 12	20.5	31.7	-11.2	20:1	12.5	26	-13.5	19:1	45	57	-12.0	3:1	25.00	38.40	-12.40	48:1
	6 and 15	20.5	49.0	-28.5	34:1	12.5	34	-21.5	144:1	45	53	-8.0	2:1	26.00	45.58	-19.58	180:1
	9 and 12	30.0	31.7	-1.7	1:1	21.0	26	-5.0	5:1	38	57	-19.0	19:1	29.67	38.40	-8.73	35:1
	9 and 15	30.0	49.0	-19.0	13:1	21.0	34	-13.0	69:1	38	53	-15.0	7:1	29.67	45.58	-15.91	450:1
	12 and 15	31.7	49.0	-17.3	6:1	26.0	34	-8.0	67:1	57	53	4.0	3:1	38.23	45.58	-7.35	9:1
U.S. No. 1	6 and 9	310.0	287.0	23.0	3:1	235.0	224	11.0	6:1	216	171	45.0	13:1	254.0	227.5	26.5	48:1
	6 and 12	310.0	288.0	22.0	8:1	235.0	236	-1.0	<1:1	216	175	41.0	12:1	254.0	233.0	21.0	21:1
	6 and 15	310.0	348.0	-38.0	12:1	235.0	216	19.0	2:1	216	181	35.0	5:1	234.0	248.7	-14.7	5:1
	9 and 12	287.0	288.0	-1.0	<1:1	224.0	236	-12.0	37:1	171	175	-4.0	(4)	227.5	233.0	-5.5	2:1
	9 and 15	287.0	348.0	-61.0	6:1	224.0	216	8.0	1:1	171	181	-10.0	3:1	227.5	243.7	-16.2	6:1
	12 and 15	288.0	348.0	-60.0	322:1	236.0	216	20.0	2:1	175	181	-6.0	1:1	233.0	248.7	-15.7	6:1
U.S. No. 2	6 and 9	95.0	61.0	34.0	17:1	94.0	92	2.0	8:1	83	75	8.0	3:1	90.5	75.9	14.6	63:1
	6 and 12	95.0	48.0	47.0	151:1	94.0	99	-5.0	2:1	83	42	41.0	37:1	90.5	63.1	27.4	55:1
	6 and 15	95.0	58.0	37.0	12:1	94.0	83	11.0	11:1	83	53	30.0	20:1	90.5	64.9	25.6	280:1
	9 and 12	61.0	48.0	13.0	5:1	92.0	99	-7.0	4:1	75	42	33.0	11:1	75.9	63.1	12.8	14:1
	9 and 15	61.0	58.0	3.0	1:1	92.0	83	9.0	9:1	75	53	22.0	7:1	75.9	64.9	11.0	11:1
	12 and 15	48.0	58.0	-10.0	2:1	90.0	83	16.0	30:1	42	53	-11.0	30:1	63.1	64.9	-1.8	2:1
Total	6 and 9	425.0	378.0	47.0	30:1	341.0	337	4.0	2:1	344	284	60.0	20:1	370.5	333.2	37.3	125:1
	6 and 12	425.0	368.0	57.0	19:1	341.0	351	-20.0	5:1	314	274	70.0	20:1	370.5	334.5	36.0	31:1
	6 and 15	425.0	455.0	-30.0	5:1	341.0	333	8.0	<1:1	344	287	57.0	26:1	370.5	359.2	11.3	3:1
	9 and 12	378.0	368.0	10.0	1:1	337.0	361	-21.0	37:1	284	274	10.0	1:1	333.2	334.5	-1.3	2:1
	9 and 15	378.0	455.0	-77.0	8:1	337.0	333	4.0	<1:1	284	287	-3.0	1:1	333.2	359.2	-26.0	7:1
	12 and 15	368.0	455.0	-87.0	221:1	331.0	333	23.0	3:1	274	287	-13.0	7:1	334.5	359.2	-24.7	9:1

<sup>1</sup> A and B refer respectively to the first and second spacing distances in each comparison listed in this column.<sup>2</sup> Infinitesimal.

TABLE 3.—*Percentage<sup>1</sup> of jumbo, U.S. No. 1, and U.S. No. 2 Porto Rico sweetpotatoes in relation to total yield for 1929-31, Florence, S.C.*

Spacing	1929			1930			1931		
	Jumbo	U.S. No. 1	U.S. No. 2	Jumbo	U.S. No. 1	U.S. No. 2	Jumbo	U.S. No. 1	U.S. No. 2
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
6 inches.....	4.8	72.9	22.3	3.7	68.9	27.5	13.0	62.7	24.1
9 inches.....	7.9	75.9	16.1	6.2	66.4	27.3	13.4	60.2	26.4
12 inches.....	8.6	78.2	13.0	7.2	65.3	27.4	20.8	63.8	15.3
15 inches.....	10.7	76.3	12.7	10.2	64.6	24.8	18.4	63.1	18.4

<sup>1</sup> By weight.

Considering the comparisons for the jumbos for the 3 years separately, table 2 shows that 16 of the 18 comparisons favored the closer spacings as a means of reducing the yield of jumbos. However, only 5 of the 16 had odds greater than 30 to 1, and which were therefore significant. Regardless of this lack of statistical significance in single seasons, the constancy of the direction of the differences indicates that closer spacing does reduce the yield of jumbos. This is brought out more clearly in the last section of table 2, which presents comparisons based on the 3-year period as a whole. Here it will be noted that 4 out of 6 comparisons of the jumbo grade are significantly different. The two comparisons that lack significance are between 6- and 9-inch spacings and 12- and 15-inch spacings. These spacings are so nearly similar that the lack of significant difference is not at all surprising.

The comparisons of the yields of U.S. No. 1 size show that 9 of the 18 comparisons were in favor of the closer spacings as a means of increasing yields, but none of these was significant. Of the 9 comparisons showing differences in favor of the wider spacing, 2 were significant, but it is apparent that the spacings studied had no consistent effect on the yield of No. 1 sweetpotatoes. The data in table 2 for the 3-year period emphasizes the accuracy of this statement. Note that 3 of the 6 comparisons showed higher yields for the closer spacing, whereas the other 3 showed the opposite. Only 1 of the 6 comparisons was statistically significant, and its importance is probably nullified by the lack of any definite trend in the other 5 cases.

Comparisons between the yields of U.S. No. 2 sweetpotatoes for the 3 years separately showed that 14 of the 18 comparisons were in favor of the narrow spacings as a means of increasing the yield of this size, and 3 of these were of statistical significance or approached it very closely. Of the comparisons showing differences in favor of the wider spacings as increasing the yield of No. 2 sweetpotatoes, 1 approached significance. These data together with those in table 2 indicate that spacings as close as 6 inches increase the yields of the No. 2 grade as compared with 9, 12, or 15 inches. Consistent differences among the 9-, 12-, and 15-inch spacings did not occur, and the tendency for the closer spacing to increase yields of No. 2's is not pronounced.

Considering the total yield, 11 of the 18 comparisons were in favor of the closer spacings as a means of increasing yield, but only 1 of these approached significance. Of the 7 negative comparisons, 2 were significant; hence it would seem reasonable to conclude that

the total yield is not appreciably affected by the spacings studied, under conditions similar to those where these studies were made. This is further indicated in table 2.

If total yields were entirely unaffected by spacing it is obvious that differences in yield of a single grade in various treatments must be the result of merely a shift in the distribution of grades. Although no consistent effects upon total yield were produced by various spacings, some considerable differences did occur. It is possible then that grade distributions might show degrees of difference or of significance other than those shown by the yields.

In an effort to determine whether distribution of grades or percentage of different grades was influenced more or less than the yields of those grades the following procedure was carried out.

The weight of each grade from each plot for each year was expressed in percentage of the total yield of that plot for that year. These figures were then treated statistically by Student's method exactly as has been shown for the data on yields of each grade.

Without presenting the detailed results of these calculations it will suffice to state that in general the same comparisons showed significant differences and that the odds of significance were of the same magnitude as shown by comparisons of yield (table 2). This is interpreted as an indication that the fields on which these plots were located were capable of supporting or producing no greater yields than obtained with the smallest number of plants per unit area that was included in this study. The dominant effect of closer spacing was merely to inhibit the development of large-size roots, with a consequently greater proportion of the nearly constant total yield showing up in the No. 2 grade. The nearly constant yield (table 2) and proportion (table 3) of the No. 1 grade is of particular interest.

#### TIME-OF-PLANTING STUDIES

The data presented in tables 4 to 7 were obtained from the time-of-planting studies.

TABLE 4.—*Effect of planting date upon yield of different grades of sweetpotatoes at Florence, S.C., 1930-32*

[Yields expressed as mean yield in pounds of quadruplicate  $\frac{1}{80}$ -acre plots]

Planting date	Yield			
	Jumbo	U.S. No. 1	U.S. No. 2	Total
<b>1930</b>				
May 15.....	<i>Pounds</i> 249±14.3	<i>Pounds</i> 475±10.6	<i>Pounds</i> 153± 5.95	<i>Pounds</i> 877±14.0
May 30.....	52± 5.4	379±18.1	154± 3.1	585± 7.53
June 15.....	42± 1.2	442± 8.7	122± 7.5	606± 9.95
June 30.....	15± 1.8	219±17.6	115± 4.8	350±14.5
July 15.....		144±21.6	119± 6.5	263±16.5
<b>1931</b>				
May 15.....	31± 3.7	280± 5.2	97±11.2	408± 6.8
May 30.....	29± 5.0	246± 8.6	131± 6.9	406±15.0
June 15.....	19± 3.3	67± 7.7	49± 4.8	135± 9.3
June 30.....	4± 1.6	60± 5.2	47± 2.5	111± 5.2
July 15.....		58± 1.9	47± 3.9	105± 4.5
<b>1932</b>				
May 15.....	172± 6.1	268±13.8	61± 7.8	501±23.9
May 30.....	126±12.3	261± 8.8	81± 9.4	468±17.1
June 15.....	111±14.6	190±15.3	85± 5.6	386±23.6
June 30.....	47± 1.4	126± 1.65	66± 9.5	239±10.6
July 15.....	31± 1.8	113± 3.9	81± 8.3	225±12.0



TABLE 5.—Comparison of yields of various grades of sweetpotatoes from plots planted at different dates during the season of 1930 at Florence, S.C.

[Yields and differences expressed as means of quadruplicate  $\frac{1}{30}$ -acre plots]

Grade	Yield of different planting dates compared				Differences (A - B)	Odds of significance
	Early planting date	Mean yield, A	Late planting date	Mean yield, B		
		<i>Pounds</i>		<i>Pounds</i>	<i>Pounds</i>	
Jumbo.....	May 15	249	May 30	52	197	>322:1
	Do.....	249	June 15	42	207	>624:1
	Do.....	249	June 30	15	234	>999:1
	May 30	52	June 15	42	10	5:1
	Do.....	52	June 30	15	37	97:1
U. S. No. 1.....	May 15	475	May 30	379	96	>322:1
	Do.....	475	June 15	442	33	37:1
	Do.....	475	June 30	219	256	434:1
	Do.....	475	July 15	144	331	>322:1
	May 30	379	June 15	442	63	14:1
	Do.....	379	June 30	219	160	69:1
	Do.....	379	July 15	144	235	78:1
	June 15	442	June 30	219	223	434:1
	Do.....	442	July 15	144	298	624:1
	June 30	219	do.....	144	75	18:1
U. S. No. 2.....	May 15	153	May 30	154	-1	2:1
	Do.....	153	June 15	122	31	32:1
	Do.....	153	June 30	115	38	>624:1
	Do.....	153	July 15	119	34	32:1
	May 30	154	June 15	122	32	18:1
	Do.....	154	June 30	115	39	171:1
	Do.....	154	July 15	119	35	19:1
	June 15	122	June 30	115	7	3:1
	Do.....	122	July 15	119	3	2:1
Total yield.....	May 15	878	May 30	585	293	1149:1
	Do.....	878	June 15	606	272	992:1
	Do.....	878	June 30	350	528	1999:1
	Do.....	878	July 15	263	615	9999:1
	May 30	585	June 15	606	-21	5:1
	Do.....	585	June 30	350	235	>434:1
	Do.....	585	July 15	263	322	>832:1
	June 15	604	June 30	350	254	624:1
	Do.....	604	July 15	263	341	832:1
	June 30	350	do.....	263	87	48:1

TABLE 6.—Comparison of yields of various grades of sweetpotatoes from plots planted at different dates during the season of 1931 at Florence, S.C.

[Yields and differences expressed as means of quadruplicate  $\frac{1}{30}$ -acre plots]

Grade	Yield of different planting dates compared				Differences (A - B)	Odds of significance
	Early planting date	Mean yield, A	Late planting date	Mean yield, B		
		<i>Pounds</i>		<i>Pounds</i>	<i>Pounds</i>	
Jumbo.....	May 15	31	May 30	29	2	4:1
	Do.....	31	June 15	19	12	6:1
	Do.....	31	June 30	4	27	65:1
	Do.....	31	July 15	(1)		
	May 30	29	June 15	19	10	69:1
	Do.....	29	June 30	4	25	28:1
U. S. No. 1.....	May 15	280	May 30	246	34	17:1
	Do.....	280	June 15	67	213	2499:1
	Do.....	280	June 30	60	220	>4999:1
	Do.....	280	July 15	58	222	9999:1
	May 30	246	June 15	67	179	9999:1
	Do.....	246	June 30	60	186	>1666:1
	Do.....	246	July 15	58	188	>2499:1
	June 15	67	June 30	60	7	2:1
	Do.....	67	July 15	58	9	305:1
U. S. No. 2.....	May 15	97	May 30	131	-34	739:1
	Do.....	97	June 15	49	48	19:1
	Do.....	97	June 30	47	50	51:1
	Do.....	97	July 15	47	50	22:1

<sup>1</sup> No yield.

TABLE 6.—Comparison of yields of various grades of sweetpotatoes from plots planted at different dates during the season of 1931 at Florence, S.C.—Contd.

Grade	Yield of different planting dates compared				Differences (A - B)	Odds of significance
	Early planting date	Mean yield, A	Late planting date	Mean yield, B		
U.S. No. 2.....	May 30	<i>Pounds</i> 131	June 15	<i>Pounds</i> 49	<i>Pounds</i> 82	>434:1
	Do.....	131	June 30	47	84	>221:1
	Do.....	131	July 15	47	84	171:1
	June 15	49	June 30	47	2	( <sup>2</sup> )
	Do.....	49	July 15	47	2	1:1
Total yield.....	May 15	408	May 30	406	2	<1:1
	Do.....	408	June 15	136	272	3332:1
	Do.....	408	June 30	112	296	>9999:1
	Do.....	408	July 15	105	303	>9999:1
	May 30	406	June 15	136	270	9999:1
	Do.....	406	June 30	112	294	2499:1
	Do.....	406	July 15	105	301	>999:1
	June 15	135	June 30	112	24	9:1
	Do.....	135	July 15	105	31	20:1
	June 30	111	do.....	105	7	2:1

<sup>2</sup> Infinitesimal.

TABLE 7.—Comparison of yields of various grades of sweetpotatoes from plots planted at different dates during the season of 1932 at Florence, S.C.

[Yields and differences expressed as means of quadruplicate  $\frac{1}{8}$ -acre plots]

Grade	Yield of different planting dates compared				Differences (A - B)	Odds of significance
	Early planting date	Mean yield, A	Late planting date	Mean yield, B		
Jumbo.....	May 15	<i>Pounds</i> 172	May 30	<i>Pounds</i> 126	<i>Pounds</i> 46	24:1
	Do.....	172	June 15	111	61	24:1
	Do.....	172	June 30	47	125	>999:1
	Do.....	172	July 15	31	142	1999:1
	May 30	126	June 15	111	15	26:1
	Do.....	126	June 30	47	79	78:1
	Do.....	126	July 15	31	95	171:1
	June 15	111	June 30	47	64	28:1
	Do.....	111	July 15	31	80	42:1
U.S. No. ....	May 15	268	May 30	261	7	2:1
	Do.....	268	June 15	190	78	19:1
	Do.....	268	June 30	126	142	322:1
	Do.....	268	July 15	113	155	>624:1
	May 30	261	June 15	190	71	30:1
	Do.....	261	June 30	126	135	>1249:1
	Do.....	261	July 15	113	148	>434:1
	June 15	190	June 30	126	64	26:1
	Do.....	190	July 15	113	77	39:1
U.S. No. 2.....	May 15	61	May 30	81	-20	158:1
	Do.....	61	June 15	85	-24	17:1
	Do.....	61	June 30	66	-5	<3:1
	Do.....	61	July 15	81	-20	>8:1
	May 30	81	June 15	85	-4	2:1
	Do.....	81	June 30	66	15	12:1
	Do.....	81	July 15	81	4	( <sup>1</sup> )
	June 15	85	June 30	66	19	7:1
	Do.....	85	July 15	81	4	2:1
	June 30	66	June 15	85	-19	5:1
Total yield.....	May 15	501	May 30	468	33	>4:1
	Do.....	501	June 15	386	115	12:1
	Do.....	501	June 30	239	262	>999:1
	Do.....	501	July 15	225	276	>624:1
	May 30	468	June 15	386	82	14:1
	Do.....	468	June 30	239	229	>832:1
	Do.....	468	July 15	225	243	>221:1
	June 15	386	June 30	239	147	37:1
	Do.....	386	July 15	225	161	55:1
	June 30	239	do.....	225	14	3:1

<sup>1</sup> Infinitesimal.

In 1930 (table 5) the yield of oversize or jumbo roots decreased significantly from the earliest planting until the June 30 planting, and there was no yield of this size from the July 15 planting. The difference between the May 30 planting and the June 30 planting was likewise significant, but that between the May 30 and June 15 plantings was insignificant.

With the No. 1 size roots practically the same relation existed, but reduction in yield was much less marked than with the jumbos. As with the oversized sweetpotatoes, there was no significant difference between the May 30 and June 15 plantings and between the June 30 and July 15 plantings.

Considering the total yield, made up of jumbos, U.S. No. 1's, and U.S. No. 2's, essentially the same situation existed as in the cases of the jumbos and the No. 1's considered separately. The May 30 planting, however, yielded less than that of June 15. Unfavorable weather during and immediately after the May 30 plantings apparently accounts for this inconsistent result.

In 1931 (table 6) the total yield of oversized sweetpotatoes was much less than in 1930, but there was a consistent decrease in yield as the planting date advanced. In the case of the first two plantings the differences were not significant, yet the yields were all consistently in favor of the early planting.

There was also a marked decrease in yield of the No. 1 size as the date of planting advanced. With the exception of the comparisons between May 15 and May 30 and between June 15 and June 30, all differences were highly significant.

The 1932 results (table 7) differ from those of the other years principally in the larger proportion of oversized roots in all the plantings, although the differences between planting dates are in general less striking. The trends are practically the same. Table 8 shows the proportion of jumbo and No. 1 sweetpotatoes for each planting date.

TABLE 8.—*Percentage<sup>1</sup> of jumbo, U.S. No. 1, and U.S. No. 2 sweetpotatoes in relation to total yield for 1930, 1931, and 1932*

Planting date	1930			1931			1932		
	Jumbo	U.S. No. 1	U.S. No. 2	Jumbo	U.S. No. 1	U.S. No. 2	Jumbo	U.S. No. 1	U.S. No. 2
May 15.....	28.0	54.0	18.0	8.1	72.9	19.0	34.3	55.4	12.3
May 30.....	8.8	64.7	26.5	7.1	60.6	32.2	26.9	55.7	17.4
June 15.....	6.9	73.1	20.0	14.3	49.2	36.5	28.7	49.2	22.1
June 30.....	4.3	62.6	33.1	7.1	53.5	39.4	19.6	52.7	27.7
July 15.....	.0	50.0	50.0	.0	65.2	34.8	14.2	52.3	33.5

<sup>1</sup> Percentage by weight.

There was a marked reduction in the proportion of oversized sweetpotatoes as the date of planting was advanced (table 8), but there was no consistent change in the proportion of No. 1. Apparently, as the proportion of oversized sweetpotatoes decreased with the later plantings, the No. 2 size increased, but the No. 1 remained practically constant.

The proportion of different grades must not be confused with the actual yields of the respective grades from plantings made on various

dates. With but one exception the tables show a successive lowering in yield of marketable sweetpotatoes as the planting date is delayed. The June 15 planting in 1930 yielded more than the previous planting, doubtless because the May 30 planting was made under temporarily unfavorable weather conditions.

### CONCLUSIONS

Spacings of 6, 9, 12, and 15 inches between plants of the Porto Rico sweetpotato in 4-foot rows showed that the closer spacings decreased the proportion and yield of jumbo size roots and that the 6-inch spacing increased the proportion and yield of No. 2 size sweetpotatoes over the 9, 12, and 15-inch spacings. These spacings did not appreciably affect the proportion or yield of No. 1 or the total yield.

Because of the additional requirements for plants and labor for the closer spacings with no appreciable increase in yield, it would seem best to set the plants about 12 to 15 inches apart in the rows. Even though this wider spacing results in the production of a noticeably higher percentage of jumbos, there is no loss of yield of the best market grade nor of total yield.

If a large proportion of the smaller sizes of roots is desired for canning whole, or for use as seed stock, this can be attained by spacing at 6 to 9 inches without loss of total yield or appreciable loss of No. 1.

There was a consistent decrease in yield of No. 1 sweetpotatoes as the planting date was delayed.

There was a consistent and more rapid decrease in the proportion of oversized sweetpotatoes and an increase in the proportion of No. 2 sweetpotatoes as the planting date was delayed.

No. 1 sweetpotatoes are generally desired, and the greatest yield of this size came from the early plantings. Even though the largest proportion of oversized sweetpotatoes is obtained from the earliest planting made in these studies, there is no indication that anything can be gained by later planting. This is because a reduction in yield of marketable potatoes accompanies the decrease in jumbos obtained by later planting.

These investigations have shown that closer spacing is better than delayed planting to reduce the proportion of jumbos, since closer spacing within proper limits does not reduce yields of marketable roots or the total yield.



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